MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

DET5078 – ANALOG ELECTRONICS 2

(Diploma in Electronics Engineering)

21 OCTOBER 2019
2:30 PM – 4:30 PM
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6** pages excluding the cover page with **4** questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided.

QUESTION 1 [25 marks]

(a) List down **THREE** advantages and **TWO** disadvantages of JFET. (5 marks)

(b) Based on the Figure 1 below, **explain** in detail the biasing process to TURN ON an NPN Enhancement Mode MOSFET. (5 marks)

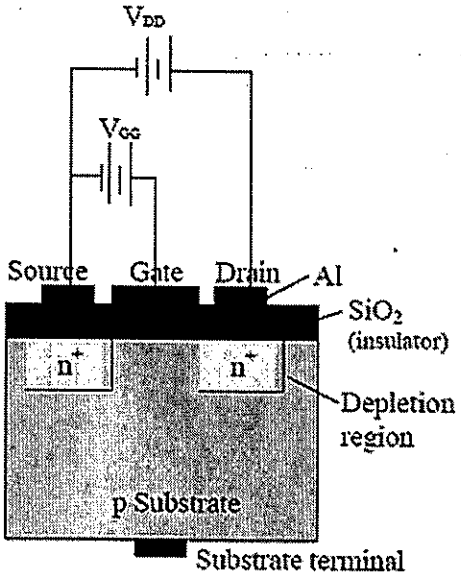

Figure 1

(c) Explain the term "biasing a transistor". (3 marks)

(d) Explain the high frequency lag network and sketch its frequency response. (4 marks)

(e) Define Miller Theorem and describe its purpose in constructing a BJT or FET. (4 marks)

(f) Describe the thermal noise of the amplifier. (4 marks)

Continued ...

QUESTION 2 [25 marks]

(a) Explain the term "amplifier noise". (1 mark)

(b) An output waveform of a Class A amplifier is not an exact replica of the input signal waveform due to various types of distortion. Briefly explain the types of distortion below:

(i) Amplitude Distortion (2 marks)

(ii) Frequency Distortion (2 marks)

(iii) Phase Shift Distortion (2 marks)

(c) Explain a major drawback of the Class B amplifier with aid of proper diagram. (10 marks)

(d) Briefly explain **FOUR** different sources that contribute to the propagation delay in the transistor switch. (8 marks)

Continued ...

QUESTION 3 [25 marks]

(a) A JFET transistor circuit is shown in Figure 2. Given $R_D = 5K\Omega$, $R_G = 1M\Omega$, $V_{DD} = 16V$, $V_{GG} = 5V$, $I_{DSS} = 10mA$ and $V_p = -8V$, find the following:

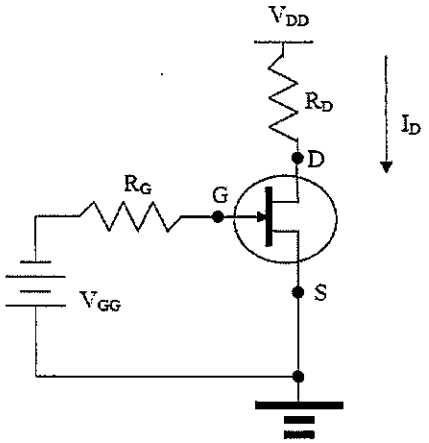

Figure 2

(i) V_{GSQ} and I_{DQ} (4 marks)

(ii) V_{DS} and V_D (4 marks)

(iii) V_G and V_S (2 marks)

(b) A type of RC circuit has a critical frequency at $f_c = 888$ Hz, above which the attenuation is approaching 0 dB. Determine the attenuation in dB at 88.8 Hz. (5 marks)

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(c) Figure 3 shows a class B amplifier circuit.

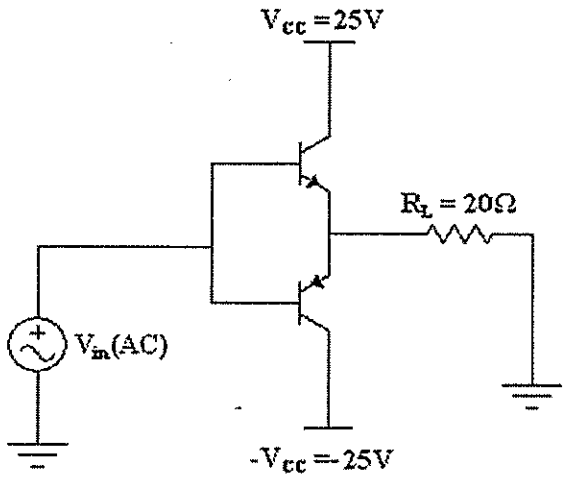

Figure 3

The Class B amplifier provides 20V peak signal to a 20Ω load. Find the following:

(i) Input power (6 marks)

(ii) Output power (2 marks)

(iii) Circuit efficiency (2 marks)

Continued ...

QUESTION 4 [25 marks]

(a) Figure 4 shows a high frequency amplifier circuit for JFET. It has a R_G = 1 MΩ, R_D = 100 kΩ, R_L = 10 kΩ and the circuit can operate up to 25 kHz. The other parameters are g_m = 5 mA/V, r_d = 50 kΩ, C_{gs} =3 pF, C_{ds} = C_{gd} = 1 pF. The coupling and bypass capacitors have large values of capacitance.

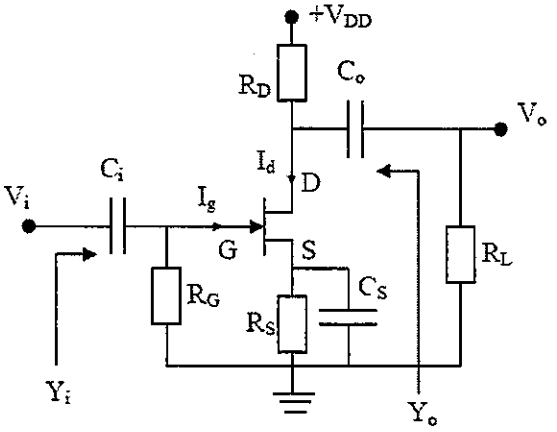

Figure 4

Determine the following:

(i) Identify the type of the amplifier in figure 4 (1 mark)

(ii) $|A_v|$ (5.5 marks)

(iii) Z_o (4.5 marks)

(iv) Y_B (3 marks)

Hint:

$G = 1/R$, $Y = j\omega C_s$, $g = 1/r$ $Y = 1/Z$

$Y_A = Y(1 - A_v)$, $Y_B = Y(1 - 1/A_v)$, $Y_i = G_G + Y_{gd} + Y_A$

$$A_V = \frac{-g_m + Y_{gd}}{Y_{gd} + g_d + Y_{ds} + G_D + G_L}$$

$Y_o = G_D + Y_{ds} + g_d + Y_{gd}$

Continued ...

(b) The Schmitt Trigger circuit that would exhibit switching characteristics is shown in Figure 5. Given that $R_{f1} = 3\ k\Omega$, $R_{f2} = 7\ k\Omega$, $R_i = 5\ k\Omega$ and supply voltages are ±12 V. Assume that the load resistance in the circuit is greater than 2 $k\Omega$.

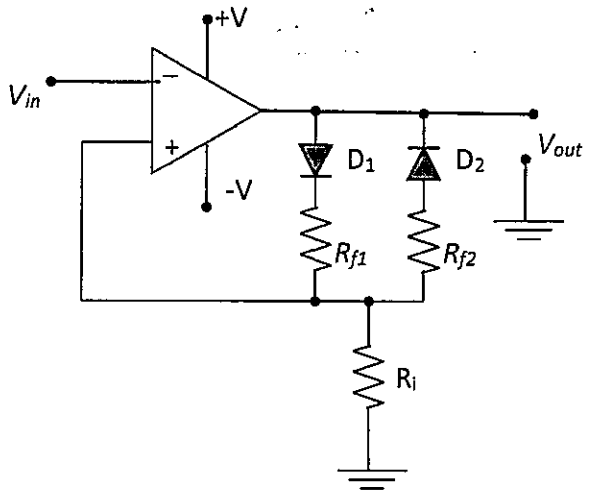

Figure 5

(i) State the type of the Schmitt trigger (1 mark)

(ii) Determine the UTP and LTP (6 marks)

(iii) Sketch the input and output signal if input signal $V_{in} = 8 \sin(\pi t)$ is applied to the Schmitt Trigger in Figure 5. (4 marks)

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